

**Measurement of High Energy Neutrons
via Lu(n,xn) Reactions**

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The diagnostic measurement of high energy neutrons in a production target assembly can be accomplished by use of small lutetium (Lu) samples that are activated by (n,xn) reactions. Information on the neutron flux and energy spectrum can be extracted from the measured activations by interpretation with a reaction cascade and neutron transport program. We are developing the Lu activation capability for application in the Accelerator Production of Tritium (APT) project.

The goal of the APT project is to establish the technology and methodology to make tritium by capturing neutrons on ^3He . The neutrons are produced by high energy protons bombarding a heavy metal target; they are thermalized before being captured by the ^3He . The diagnosis of high energy neutrons in APT prototypical physics measurements can be used to test and constrain the neutron spectrum calculated for APT by software codes and models.

The activation of lutetium samples has been successfully measured in several target assemblies. Ratios of different activation products in these tests, for example $^{169}\text{Lu}/^{172}\text{Lu}$, demonstrate that spectral information is contained in the measured data. In order to quantitatively extract that information, Lu(n,xn) cross sections are required. We are proposing to measure these cross sections with the GEANIE spectrometer at the LANSCE accelerator.

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